REMARKS

The Examiner has maintained his rejections, but did not acknowledge the combining feature of the invention, in which the information is combined with a spread sequence to obtain a spread information signal. In the amended Claims 1 and 14, Applicant has further specified this feature by saying that the information includes information bits, and by saying that the step of combining includes spreading the bits based on a spread spectrum modulation by combining the bits with the spread sequence. This amendment is supported in the specification as filed by lines 10 to 15 of the "final version of PCT/EP00/09771."

To stress this feature even more, Applicant has added new Claims 15 and 16, which are supported in the specification as filed by page 22, line 13 regarding the pseudo noise spread sequence" and page 22, lines 16 to 21 regarding the spread sequence and the inverted spread sequence.

Before discussing the prior art reference and the Examiner's statements in the final Office Action in more detail, Applicant will review the technique which is behind the step of combining, as defined in Claim 1. The information introduced into the data stream includes bits. However, when the spread sequence is not used, then a transform of information signal results in a very narrow spectrum. When this information signal having a narrow spectrum is then weighted and summed with the spectrum of the audio signal, then the situation might come that due to the step of weighting, this short --typically low frequency – spectrum is weighted to zero or almost zero and the information is introduced into the data stream very weakly. Because the step of weighting is performed using the established noise energy determined based on the psychoacoustic model, as defined in the fifth paragraph of Claim 1, the weighting factors per frequency unit are dependent on the audio signal itself. Thus, when one does not perform the step of combining using a spread sequence the possibility is high that, in the weighting step, the information signal is weighted to zero or almost zero, so that the processed data stream does not include the information or includes the information only with a very small energy.

To avoid this disadvantage, the information having information bits is combined with a spread sequence to obtain a spread information signal. When this spread information signal is transformed into the frequency domain, the spectrum of the signal is much broader than the spectrum would be without using the spread sequence. This is due to the well-known spread spectrum modulation scheme which uses a spreading sequence, in which the information bits are combined with the spread sequence. Stated differently, one bit of information results in a plurality of spread sequence values due to the combination so that the spectrum of the spread information signal is significantly broader than the spectrum of the information signal itself.

Thus, the information is introduced into the audio signal not only into a very narrow spectral range, but is introduced into the audio signal over a broad spectral range. Thus, the probability that, in the step of weighting, the spectral spread information signal is weighted to zero over the broad spectral range is much smaller compared to the cases in which the spread sequence was not used.

In view of this, the inventive feature of combining using a spread sequence based on a spread spectral modulation results in a considerable improvement because, in accordance with the claimed invention, the chance to extract the introduced information is much higher than it is in a situation in which the information is introduced only into a small spectral range, which is the case when the information signal is not spread.

With regard to Kate, the Examiner asserts that the "digital audio carrier is with regard to frequency masking sound," Applicant does not understand this statement. Nevertheless, when one looks at Fig. 1 of Kate, one can see that Kate does not disclose the step of combining. Instead, the main signal M in Fig. 1 and the auxiliary signal A in Fig. 1 are both filtered to obtain a subband domain representation. In the combiner in Fig. 1 of Kate, the main signal M and the auxiliary signal A are combined. Thus, this step can only by compared to the "summing" step of Claim 1. However, in the step of combining, the information is combined with a spread sequence, as defined in the third paragraph. If Kate had this feature, then the auxiliary signal A would have to be processed using a spread sequence before being combined to the main signal M. However, such processing using a spread sequence is not shown in Kate.

Particularly, Kate does not show that the combining includes spreading the bits based on a spread spectrum modulation by combining the bits with the spread sequence. The only thing which is done in Kate with the auxiliary signal is described in the second paragraph of the second column of page 1098. Particularly, the auxiliary signal is attenuated sufficiently, as shown in Fig. 2. Then, the auxiliary signal and the quantized main signal are added.

However, Kate is completely silent on any spreading operation to be performed on the information or auxiliary signal.

In view of the above, it becomes clear that Kate is completely silent on the usage of any spreading feature, thus Kate does not disclose the third paragraph of Claim 1, the fourth paragraph of Claim 1, and the sixth paragraph of Claim 1.

Regarding independent Claim 11, Applicant has amended this claim by incorporating the features of Claim 12 into Claim 11.

Although the Examiner is correct when saying that the quantization step size is varied when encoding an audio signal due to the fact that the psychoacoustic masking threshold is frequency-dependent, the Examiner reaches an incorrect conclusion because all audio encoders quantize such that the noise energy is <u>equal to</u> the psychoacoustic masking threshold. Then, the maximum compression gain is obtained.

In accordance with the claimed invention, however, the maximum compression gain, *i.e.* the maximum noise energy, is <u>not</u> desired. Instead, the spectral values are quantized so that the introduced noise energy is smaller than the psychoacoustic masking threshold by a predetermined amount. This means that the bitstream, as generated by the method of Claim 11, requires more bits because the quantization step sizes are smaller compared to Kate's audio encoder. However, these extra bits allow secure introduction of additional information into the audio signal by using up the predetermined amount of noise energy in a subsequent introduction of additional information into the audio signal by a device as, for example, defined in Claim 1. Thus, the feature in the fourth paragraph of Claim 11 is different when compared to Kate and when compared to the Examiner's arguments

because the variation of the quantization step size, as stated by the Examiner, is not that the noise energy introduced by the quantizing is equal to the psychoacoustic masking threshold while, in accordance with the claimed invention, the noise energy introduced by quantizing is smaller than the psychoacoustic masking threshold by a predetermined amount. The amount is not determined by chance, *i.e.* by the signal itself, but is predetermined, *i.e.* it does not depend on any quantizer settings controlled by the audio signal itself.

Furthermore, in accordance with amended Claim 11, the bitstream includes an indication for the value of the predetermined amount, which can then be used by an information introducer, for example, as defined in Claim 1 to control the correct weighting of the spectral spread information signal.

Regarding Claim 12, the Examiner has pointed to page 1098, left column, first to third paragraphs. Then, the Examiner asserts that "the predetermined amount is the estimated subband." However, as stated in the second long paragraph of the left column of page 1098, Kate does not produce an "estimated subband." Instead, the power of the main signal in each subband is estimated. However, a maximum signal level, which can be masked in each subband can only compared to the "psychoacoustic masking threshold" in the fourth paragraph of Claim 11. However, this value does not have any relation to a predetermined amount saying that a noise energy introduced by quantizing has to be smaller than the psychoacoustic masking threshold. Stated differently, the estimates, which are the maximum signal level which can be masked in each subband give the psychoacoustic masking threshold but, of course, do not give any information on a noise energy, which is different from the masking threshold by the predetermined amount.

Finally, the cited passages do not say anything with respect to an introduction of any "estimated subband" into a bitstream, which might correspond to the feature of "including an indication for the value of the predetermined amount" into the bitstream.

In view of the foregoing claim amendments and remarks, the application is deemed to be in allowable condition and Applicant respectfully requests that the Examiner reconsider and withdraw his objection.

Should the Examiner deem it helpful, he is encouraged to contact Applicant's attorney, Michael A. Glenn at (650) 474-800.

Respectfully submitted,

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